

MILITARY SPECIFICATION
SAMPLER, CRYOGENIC LIQUID

1. SCOPE

1.1 This specification covers a cryogenic liquid sampler consisting of a sampling assembly, shipping cylinder and accessories.

2. APPLICABLE DOCUMENTS

2.1 The following documents form a part of this specification to the extent specified herein. The applicable issue of the governmental documents shall be the issue in effect on date of invitation for bids or request for proposal. The applicable issue of the nongovernmental documents shall be those that are available in the files of the procuring activity and are made a part of the invitation for bids or request for proposal.

SPECIFICATIONS

Federal

O-T-634 Trichloroethylene, Technical

Military

MIL-O-27210 Oxygen, Aviator's Breathing, Liquid and Gas

Standards

Military

MIL-STD-129	Military Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-808	Finish, Protective and Codes for Finishing Schemes for Ground and Ground Support Equipment
MS24548	Hose Assembly - Tetrafluoroethylene, Oxygen
MS33656	Fitting End, Standard Dimensions for Flared Tube Connection and Gasket Seal

Air Force – Navy Aeronautical

AN929

Cap Assembly, Pressured Seal Flared Tube fitting

DRAWINGS

Ordnance Corps

C8987831

Assembly, LOX, Coupling, Female Half, All Sizes

B8987839

Ring, Retaining, LN₂, 1-Inch, 2-Inch, 2-1/2-Inch, 3-Inch, LOX, 1-Inch, 2-Inch, 2-1/2-Inch, 3-Inch, 3-1/2-Inch, 4-Inch

C8987856

Cone, LOX, Coupling, 1-Inch

C8987857

Nut, LOX Coupling, 1-Inch

C8987870

LOX, Plug, 1-Inch

Cosmodyne

2702701

Cryogenic Sampler System

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

Department of Transportation (DOT)

49 CFR 100 - 199

DOT Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles

(The DOT regulations are now a part of the Code of Federal Regulations (1949 Edition-Revised 1950) available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20325. Orders for the above publication should cite 49 CFR 100 – 199.)

3. REQUIREMENTS

3.1 Components. The sampler shall consist of the following major components:

<u>Description</u>	<u>See Drawing</u>
Liquid Sampling Assembly	2702701
Shipping Cylinder	2702704
Case	2702715
Hose	2702476
Adapter	2702439

3.2 Materials. All metallic and nonmetallic materials utilized in the sampler shall be safe for use with oxygen.

3.3 Design. The sampler shall include all parts and accessories for:

- a. Being connected to a cryogenic vessel and obtaining a representative sample of liquid
- b. Converting the liquid sample to gas, transferring to a cylinder and retaining it without loss of pressure for shipment to an analysis laboratory

3.3.1 Configuration. The liquid sample container shall be capable of being precooled to the atmospheric pressure boiling temperature of the liquid being sampled prior to the actual sampling operation. The overall configuration of the sampler is shown on Cosmodyne drawing 2702701. The cylinder shall be certified to DOT Specification 3A1800.

3.4 DOT approval. The sampler shall be constructed and certified in accordance with those portions of DOT Regulation 49 CFR 100 – 199 applicable to equipment of this type that will be shipped interstate by public carrier.

3.5 Performance.

3.5.1 Sample volume. The sampler shall be capable of providing a gaseous sample with a minimum volume of 100 standard liters (at 70°F and 760 mm Hg.)

3.5.2 Leak test pressure. The sampler shall be capable of being pressurized to 1600 psig with gaseous oxygen without exhibiting leakage.

3.6 Weight. The weight of the sampler and its accessories shall not exceed 40 pounds.

3.7 Finishes and protective coatings.

3.7.1 Surfaces contacting oxygen. All surfaces, parts, fittings, etcetera, of the sampler that will be in contact with high-purity oxygen shall be thoroughly cleaned with a nonflammable solvent, such as trichloroethylene, to remove all metal shavings, oil, grease, and other foreign materials. No other cleaning, priming, or painting with organic materials shall be performed on these surfaces.

3.7.2 Exposed parts and surfaces. All exposed parts and surfaces, except parts and surfaces that contact high-purity oxygen, shall be cleaned, treated, and finished as specified in MIL-STD-808. When more than one finish process is permitted by MIL-STD-808 for a part or surface, the most applicable finish process shall be determined by the contractor unless otherwise specified herein.

3.8 Operational markings.

3.8.1 Inlet and outlet fittings. The inlet and outlet fittings shall be clearly identified by markings either etched or stenciled directly on the sample bottle.

3.8.2 Instructions. Operating instructions shall be provided on a plate of sheet aluminum or zinc of not less than 0.050 inch thickness, anodized or etched to produce raised markings with a black or other dark color background, and with a border of not less than ¼ inch. The plate shall be attached to the top half of the case by rivets. The plate shall be located on the side of the sampler case so that the instructions can be read when the case is in an upright position.

3.9 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.10 Workmanship. All parts of the sampler shall be fabricated and finished in a workmanlike manner. Particular attention shall be given to the following:

- a. Freedom from blemishes, defects, burrs, and sharp edges.
- b. Accuracy of dimensions, radii of fillets, and marking of parts and assemblies.
- c. Thoroughness of soldering, welding, brazing, painting, and riveting.
- d. Thorough removal of rust, slag, scale, flux, and other foreign materials from inside of the sampler and all other surfaces that contact the oxygen in either liquid or gaseous form.
- e. Alignment of parts and tightness of assembly screws, bolts, rivets, etcetera.
- f. That rivets are tight and properly headed.

3.11 General cleaning instructions. Following completion of fabrication and assembly operations, the sampler shall be thoroughly cleaned and degreased to remove all contaminating materials. Particular emphasis shall be placed upon complete removal of all traces of cleaning fluids utilized. The adequacy of the cleaning operation shall be verified by pressurizing the sampler to 1600 psig with gaseous oxygen which has been analyzed for trace constituents by use of an infrared spectrophotometer. The gas from the cleaned sampler shall be introduced into an infrared spectrophotometer and analyzed to determine if trace constituents were introduced from the sampler. The sampler shall be considered to be clean when no increase in contaminants is detected.

3.11.1 Cleaning. The sampler shall be thoroughly cleaned to remove excess and spilled lubrication materials, loose or chipped paint, spilled chemicals, and other foreign materials. All cleaning solvents shall be removed from the sampler components prior to delivery.

3.11.1.1 Degreasing. Sampler surfaces, parts, fittings, etcetera, that will be in contact with high-purity oxygen shall be degreased by one of the following methods:

Method A – Vapor degreasing process, using stabilized trichloroethylene conforming to O-T-634 in a standard commercial vapor degreaser or by blowing degreasing vapors into the component in such a manner that the vapor will condense on and properly clean all surfaces requiring degreasing. Operation of a commercial vapor degreaser shall be in accordance with the manufacturer's recommendations. Following the vapor degreasing treatment, all

solvents shall be removed by baking in an oven; by purging with hot, dry, oil-free air or nitrogen; or by vacuum evacuation.

Method B – Solvent degreasing process, using stabilized trichloroethylene or commercial oxygen safe cleaning solvent at ambient temperatures to thoroughly wash all surfaces requiring degreasing. Following the degreasing process, all solvents shall be removed by baking in an oven; by purging with hot, dry oil-free air or nitrogen; or by vacuum evacuation.

Method C – Detergent degreaser process, in which the components to be cleaned are washed with hot, inhibited alkaline cleaner until free from oil, grease, and other contaminants materials. Following this treatment, all surfaces (internal and external) shall be rinsed thoroughly with fresh, clean, hot water and dried by blowing with filtered and dried oil-free air or nitrogen or by baking at a temperature of 250°F to 300°F until all water is removed.

3.11.1.1.1 Flammable solvents. Petroleum and other flammable solvents shall not be used on such surfaces.

3.11.2 Final cleaning and pressurizing. Following assembly and completion of all testing, the sampler shall be emptied and placed in an oven with a minimum temperature of 250°F. While in the oven, the sampler shall be purged with 100 cfm of aviator's breathing oxygen or dry, oil-free nitrogen at 250°F. Upon completion of the purging operations, the unit shall be evacuated to an absolute pressure of 100 microns Hg while still in the oven. The sampler shall then be removed from the oven, the vacuum broken and the sampler pressurized with dry, oil-free gaseous aviator's breathing oxygen to a pressure of 25 psig and all openings closed. A type A tag conforming to UU-T-81, with tag and printing waterproofed, stating that the sampler is clean and pressurized with clean, dry, oil-free, aviator's breathing oxygen shall be securely attached to the sampler valve handle.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may use his own or any other inspection facilities and services acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to insure supplies and services conform to prescribed requirements.

4.2 Classification of tests. The inspection and testing of the sampler shall be classified as follows:

- a. Individual tests see 4.4

4.3 Test conditions

4.3.1 Apparatus. Insofar as practicable, apparatus used in conjunction with the testing specified herein shall be of laboratory precision type and shall be calibrated at intervals properly spaced to insure continued laboratory accuracy.

4.3.2 Pressure gage accuracy. Data on gage pressure shall be accurate to within 10 percent.

4.4 Individual tests. Each sampler shall be subjected to the following test as described under 4.5:

- a. Examination of product see 4.5.1
- b. Mechanical inspection see 4.5.2
- c. Functional check see 4.5.3
- d. Pressure test see 4.5.4
- e. Individual operational test. see 4.5.5

4.5 Test methods

4.5.1 Examination of product. The sampler shall be examined to determine compliance with this specification with respect to materials, workmanship, and marking and as specified herein.

4.5.2. Mechanical inspection. A mechanical inspection of all components and parts shall be conducted. All pertinent data concerning conditions, defects of manufacture, damage in transit, and damage through use prior to test shall be recorded.

4.5.3 Functional check. All mechanical parts shall be checked for free and proper functioning.

4.5.4 Pressure test. The sampler shall be pressure-tested and certified in accordance with DOT Regulation 49 CFR 100 – 199.

4.5.5 Individual operational test. Each sampler shall be connected to a source of liquid oxygen. The sampler shall be used in accordance with the operational instructions to obtain a liquid sample. The sampler shall then be disconnected from the liquid source and the sample allowed to vaporize. A resulting cylinder pressure of less than 1600 psig shall be cause for rejection. The cylinder shall then be left pressurized for at least 24 hours. Any loss of pressure attributable to leakage shall be cause for rejection.

4.5.6 Cleaning effectiveness test. One unit from each lot of 25 or fraction thereof shall be selected at random from the completed and cleaned samplers ready for shipment. The sampler shall be pressurized to 1600 psig with gaseous oxygen or nitrogen which has been analyzed for trace constituents by use of an instrument or instruments capable of determining trace constituents at the level specified in MIL-O-27210. The gas from the sampler shall then be introduced into the same analytical equipment to determine if any trace constituents were introduced from the sampler. If any additional trace constituents or an increase in the level of any

of the original contaminants is detected, the sampler shall be rejected and recleaned. Any rejected samplers shall be individually checked after recleaning and will be accepted only upon being proven clean. In the event that a sampler from a given lot fails to meet the cleanliness requirements, three additional samplers shall be selected at random from the same lot and tested for cleanliness in the same manner. If any of the three additional samplers is rejected, the complete lot shall be rejected, recleaned, and subjected to the test again. Any lots which have been rejected shall have five samplers selected at random and subjected to the cleanliness test. If any of the five additional samplers selected fails to meet the requirements of 3.11, each sampler in the lot shall be subjected to the test and accepted only upon satisfactory completion of the test.

4.6 Inspection of preparation for delivery. Preservation, packaging, packing, and marking shall be inspected to determine compliance with the requirements of section 5, or the documents specified therein.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, and packing. Preservation, packaging, and packing for all levels shall be as specified in 5.1.1.

5.1.1 Levels A, B, and C. The sampler, manufactured in accordance with the requirements of section 3, shall be overpacked for shipment and storage. (See 6.2)

5.2 Marking. In addition to any other marking required by the order or contract (see 6.2), the case shall be marked in accordance with MIL-STD-129 and Title 49 CFR Parts 100 – 199.

6. NOTES

6.1 Intended use. The sampler is intended for obtaining representative samples of liquid oxygen or liquid nitrogen to permit close quality control of the liquid oxygen or nitrogen.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this purchase description.
- b. Level of protection.

Custodian:
Air Force – 68

Preparing Activity:
Air Force – 68 (99-FCM)

Project No. 6685-F620